Ю Я Лея

Песледование кислотообразования в желудке Москва «Медицина»

# Study of Gastric Acid Secretion J. Leja

Translated from the Russian by E KOLTSOVA Royal graft sellent BEFAS.

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### Contents

#### Preface

Chapter

pH-Probes, Apparatus and Techniques of Introduc. 2

Multi-channel pH-Probes of Closed Type Probes of Portable pH-Meter with a System for Collecting Gastric Juce pH-Microprobes

pH-Microprobes Probes for Combined Study of the Stomsch and Duodenum The Calomet Electrode

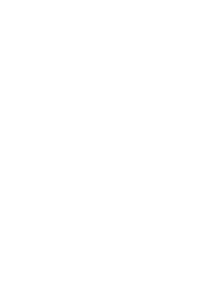
Gastric Acidimechanograph and Gastropolygraph Portable pH-Meters

Position of pH-Probes
Position of the Probe in the Stomach
Steel Mandrins for Easier Introduction of the Tube into
Duodenum

### Chapter

Examination of the Motor and Acid-secreting Futions of the Stomach

Study of Gastric Motor Activity Study of Gastric Acid Secretion by means of the Portable ;



# Preface

Early disgnoss of diseases of the stomach with recognition of its functional disturbances is an essential stage in the development of gastroenterology Determination of the pattern governing gastric acid secretion plays an important role in this connection Many various methods are used for studying gastric function, among which measurement of plf in the zones where acid secreting and neutralizing gastric glands are located is winning ever more recognition

Taking into account the fact that the modern surgical clinic requires more securate methods for inactional dispcent of the control of the control of the control of the study the possibility of every-day made an attempt on objective method for investigation of acid secretion in the stomach and also to find other means of using it in surgical practice. The present work is a continuation of the study in the clinical aspect which was begun by Linar,

This problem was studied in experiments and in the clinic at the Diagnostics Department of the Center of Gastroenterology and Dieteters (GGED) of the Ministry of Health of the Latvian Soviet Socialist Republic. We crammed more than 16 000 patients using methods of pH-memure described than 16 000 patients

were d which, in our opinion, interest, ands of study were

, of the sto-



Chapter

1
pH-Probes, Apparatus
and Techniques
of Introducing pH-Probes

Electrometric determination of pH is based on the following principle: when electrodes are immersed into solution the arising chemical processes are attended withe production of electric energy, just as it happens galvanic cells (Vinogradova, 1950, Linar, 1968). The dference of potentials between the measuring electrode of the reference electrode forms the electromotive force (ES) whose value depends on the activity of hydrogen ions, the electrolyte This difference is insignificant. A dircurrent amplifier to which an indicating or recording of vice is connected is used for measuring EMP.

Thus, to study the pH in the upper portion of the gast intestinal tract by means of the probe technique it is a cessary to incorporate into the olive of the probe a measing and reference electrodes. A glass electrode (Benlin 1954, Hemmati, 1968) or antimony electrode (Linar, 194 Pantayrev et al. 1972) is smoot commonly used as the measing electrode. The glass electrode possesses high presion and sensitivity but, due to its fregulity, it requires the same of the sense o

In the USSR a variety of pH-probes with antimor calomel electrodes are used. Linar's (1964) gastric proshould be recognized as the basic one for all of them.

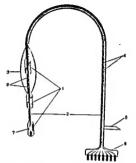


Fig 1 Schematical representation of a multi-channel pH-probe f, allies of the probe grabbe grade g, this nabbe balloon, a wires stretch internation and adjusted the probes of the probe

# Multi-channel plf-Probes of Closed Type

1972)

A probe with tan antimony electrodes was manufactured in Henning's Laboratory (Henning et al. 1951) but it design does not allow live allower/Healin in clinical practice. Linar's gentle probe for studying as very portions of the mediate pill "I probe is currently man". "Tyrev et al."

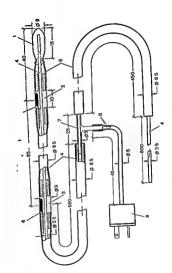
into the curves of these proces, and for smarping muter activity of the stowerh a thin rubber balloon may be connected to the probe in other words, the design of multi-channel pil-probes depends on the purpose of the hypothetic study (Fig. 4)

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# Probes of Portable pil-Meter with a System for Collecting Gastric Juice

When studying the acid-secreting activity of the stomactive is assecting becomes necessary to collect gastic just to determine the hour tension of gastrio secretion and the activity of proteolytic engages, to carry out microscopy, etc. Beades, now that intragastric pil-metry is being introduced into clinical practice, the practising physic-man see the advantages of the method being described, as they compare its data with those simultaneously obtained by ittration.

We strove to make a probe of the simplest design (a in et al., 1971) for the examination of the internal medium in two portions the stomach with simultaneous collection of gestine properties, in addition to the system for collecting properties, and diffuse to existent for collecting strength growth of the collecting and the collecting properties of the collecting properties of the collecting and the collecting properties of the collecting and the collecting properties of the



corresponds to the outer diameter of the ends of the electrodes, while the inner one to the diameter of the middle opening not be electrodes. The Tellon bushings are put into a special metal mould which commists of two parts The mould is placed in a vertical position and filled with melied antimony. The latter envelops the Tellon bushings and,

bushings, e.g. of polyethylene or organic glass. After the glus dries the antimony electrode is ready for assembling into a pH-microprobe.

The pH-microprobe thus made is more durable. At present

we make four-channel pH-microprobes with an inner systen for infusing fluids by the drip method (Fig. 4).

Probes for Combined Study of the Stomach d Duodenum



Fig 7 Metal mould with antimony ingots

In assembling the probe the connecting vinyl chlor tuties are filled with barium sulphate powder to provacter outline of the probe during X-ray study. Tests his hown that otherwise its difficult to watch the positiof the probe because the shadow of the vinyl chloride tuseen during X-ray study is very small.

At present we use two, three and four-channel pli-neroprobes. Two and three-channel microprobes are intended for studying seld-secreting function in patients with clerate the probing procedure poorly, and for investigating gastro-ecophageal reflux. Four-channel microprob are used in prolonged examination of the seld-secreting the processing properties of the seld-secreting the processing the processing the secreting th

therefore the electrodes often break.

In order to correct this defect we have been using sinc 1973 another technique for producing antimony electrode for pif-microprotes (Lejs. 1973). Special thermore-sistan bushings are first made of Tefton. Their outer dismetric

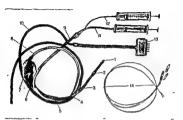
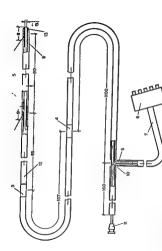


Fig. 5. Probe for combined examination of the stomach and duody-

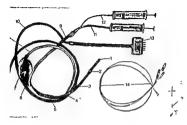
i trodes are fitted into the probe so that when it me inforduced the detail electrode is in the apper portion of the duodenum, the intermediate one in the pyloric antirum and the proximal in the body of the stomach. The calomel electrode is brought out. A balloon as attached to the probe proximal to the body electrode, are to the balloon passes between the inner varyl chloride tabe and the outer probe, here also pass wires from the antimony electrodes to the plug of the plug and socket unit.

Four uff-cluses and a third channel distinguish the sec-

or pit-clives and a three channel distinguist he serord model probe (Fig. 5). The fourth pit-clive = distal 10 the hollow clive for collecting his and pancreatic sectetion, and, with the probe being introduced, it si located in the lower portion of the duodenum. The three channel of the probe opens above the halloon, at the entrance it



of four-channel pH-microprobs with a system for enteral drip in-



5. 5 Probe for combined examination of the stomach and duode-

ides are fitted into the probe so that when it is introced the distal electrod is in the upper portion of the indexum, the intermediate one in the pyloric antum d the proximal in the body of the stomach. The calomal extrede is brought out. A balloom is attached to the probe named to the body electrode, are to the balloon passes tween the uner vanyl chloride tube and the outer probe, we also pass wires from the antimony electrodes to the 'ug of the plug and socket unit.

Four pH-olives and a third channel distinguish the secid model probe (Fig. 5). The fourth pH-olive is destalin the hollow clive for collecting bile and pancratic section, and, with the probe being introduced, it is located in the lower portion of the duodenum. The third channel is the probe opens above the halloon, at the entrance to the stemach, as 1, just like the appreca for gullertural durates at excitable, this is a margit efficile to be which the other processing of the other processing and the processing of the other processing and the processing of the other processin

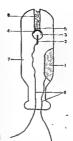
### The Calemet Electrole

In all the above described greater a examine of a electrule serves as the reference electrate. This print? to und in a tweet speel gli gents of the closed type to nufactured on a more scale. It has a calomet electroles fusted in the entral clive, which is eccession for the lor and antral antimony electrodes Large (1905) cord de special investigations which showed that on external el emel electrode may be employed. An additional electra which was attached to the patient's hand or leg was to nected with the recording apparatus parallel to a prifitted with antimony and caloniel electrodes. Alterny connection of the probe calomel electrode and the alti and calomet electrode shound that the EMF of the at atony and the external calomel electrodes was less by I P cent than the LMF of the antimony and the internal calelectrodes. In 1972 we compared 434 readings of calcaelectrodes located in the probe, in the mouth and on the skin of the hand of 30 patients Mis treatment of the data obtained by means of the test for paired observation it was established that the differences between the readmi of these calomel electrodes were statistically significan but not high Thus, intragastric pil value shown by th calomel electrode placed in the mouth was by 0.06 high? on the average, than that recorded by the calomel electroof the probe. The pil readings of the external calomel eletrode were by 0 26 lower, on the average, than thee! the probe calomel electrode Consequently, taking the data into consideration one may correct the results obtains and make successful use of the advantages of the externa calomel electrode These advantages make it possible apply in clinical practice pH-microprobes and various coo bined probes without increasing their external diameter which is of essential importance for the patient who is being boutmera

The design of the internal and external calomel elec-

trodes is in essence the same. The end pH olive m represented schematically in illustration (Fig. 6)

The calomel electrode is a filled tunnel in the body of the pH-olive Filling the calomel electrode. With the clive held erect, the electrode is filled as follows. a platinum wire pressed into the body of the probe olive is covered with a layer of pure mercury by means of a fine pipette The tunnel in the olive in then filled with saturated potassium chloride solution The morcury layer is covered with a thin layer of calomel paste prepared from calomel, carefully ground with mercury, and potassium chloride (Linar, 1968) Several crystals of potassium chlotide are placed above the calomel pasts The remaining part of the tunnel (above the notessium chloride crystals) m filled with pieces of filter paper or chemically pure esbestos impregnated with saturated potassium chloride solution, taking special care not to distort the drop of mercury When discharging an old or filling a new calomel electrode it is advisable to



For 6 Schematical representation of the end pH-ohre

antimony electrods. platinum wire, a, pure me ory, &, calomel ry, s, calonel paste, s, taxsium chloride crystals s, filter paper F, polystyretimony and calonel electrodes

use fine glass pipettes and injection needles with the sharpened tip hent. The calomel electrode should be used only when 24 hours passed after it had been filled (Linar, 1968) so that its contents would become adjusted.

The filled calomel electrode should be protected from drying for which purpose it is covered with a rubber cap filled with potropated notages on ablanda and anA cut in al also tendo dilete and arread gregority dillitation with come orders the a tengential of this

To entire that train, more of a delicial sharm which for motion be general? If a lab former than the entire that the primate with the motion of the first of contract that the primate with, the body of electrole is made of a glow take 35 to 40 mm in durfure bothers of the take is found over time that there bothers of the take to first over the electrons when he had not the following the first that the first that the latter is growed through the given the that the special technological and made of Tables, argued for and even would the outer discovered which armony of the two two distributed of the first made at the first on the former of the primary of the first on the former of the primary of the state of the first on the former of the first one of the primary o

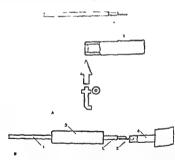


Fig. 7. Manufacturing of the outer calomel electrods

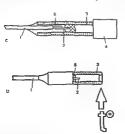
A, platinum wire is soldered to the electrode wire and the end of the calors
electrode body is sected a, electrode wire, a platinum wire J, stan the tirfrode body, B, the electrode wire is passed through the glass the tire
body and a feathwhelectro and is stired in place J, electrode wire, I, platinum

end of the platinum were In one end of the technological rod a hole 2.5 mm deep is drilled for litting it on the plati-

num wire, on the other end there is a handle

The glass tube (the body of the electrode) is then filled with insulating material which can harden, e.g. epoxy of the plant of the electrode were are usered into the body of the electrode were are usered into the body of the electrode (Fig. 7C), squeezing the filling out of it Durging hardening of the insulating material the technologies, an insulation (right-energy in the complete hardening, an insulation (right-energy in the body of the electrode, while the free end of the electrode were me connected to the electric plus (Fig. 7c) in studies of work The outer butt-end of the electrode body is fused over flame (Fig. 7d)

The external calomel electrode is transparent. It is easy



in 2. giam tube (efectrode body), 4, ferbandozical rod, C. insertion of the chonorical rod into the electrode body 2, sizetrode wire 2, platinum wire, electrode body 4, hands of sechnological rod 5, insulating filler D, the uter end of the electrode body is meltired the same designation as in Fig. 12

to fill and, when necessary, to clean it. This electrode been tested in the examination of 3000 patients and shown good efficacy.

## Gastric Acidimechanograph and Gastropolygraph

The gastric acidimechanograph and gastropolygraph we claborated at the Research Institute of Experimental & Clinical Medicino under the direction of Prof. Line Line (Line)

The acidimechanograph is intended for determining the of one of the portions of the stomach and gastre more activity. During the development of this method it established that it was not sufficient to record the pil just one grastre portion. At present most of the achimett more of the achimett of the achimetr of the

them for pH measurement

In 1964 the VEF Plant manufactured a four-chan-Illi-64 gastropolygraph (Fig 8), it is supplied with recording galvanometers which are connected with h amplifiers Such a multichannel system of the gattro lygraph design enables one to use it for simultaneous cording of the indices of acid secretion and heat prodtion in several portions of the stomach. Like the seld chanograph, the gastropoly graph is supplied with a bat of metal capsules and an intragastric pressure manon for recording the motor sctivity of the stomach, and with three relay markers, time, stimulation, and the shold of patient's subjective pressorensitivity. Auximarkers are attached to an additional panel of the ga polygraph which are intended for tracing additional on the gastropolygram The amplifiers of the Hill-61 tropolygraph can be easily removed and mutually repla

### Portable pH-Meters

In the above-described appearates for automatic pill cording the principle of attachment of one amplifie rate dire of the probe is used. As a result only one pat at a time can be examined by means of the crattle a reclamorally and sestepolygraph. This of course, and satisfy remains of the clinic function of the principle of the



of Experimental and Clinical Medicine (Linz, 1770) other principle is applied in these apparatus: a single amplifier is alternately switched from one patient to other.

A portable OP-2 pH-meter has been used for now four years in the Blagnostics Department at the CFG 90 Portable pH-meters manufactured by the technika Factory of the Lattian SSR are current used. More than 0,000 examinations conducted by apparatus show that it can be used in clinical practice.

# Introduction of pH-Probes

Routine examination of the functional state of the ach by means of the acidimechangersph, gastupply or portable pll-meter is conducted in the monast loating stomach. When pil-probes with a balloon are all the after a superiord from the balloon before the lithin after a superiord from the balloon before the authority of the time of the surface of the time of the surface of the su

A probe may be introduced passively or actively, in its case the patient sits with his head slightly best for ward and he swallows the probe without anybody's an annex, commonly used probes are introduced through mouth. In the second case the examiner introduces the prober during the procedure it is advisable to prise patient's tongue lightly with the index finger of the patient's tongue lightly with the index finger of the patient's tongue lightly with the index finger of the patient in the mouth so that it cannot bend. Patwell the probe in the mouth so that it cannot bend. Patwell the probe passes from the early particularly in the probe at vances easily with the patient breathing deeply. Patwell usually find active interton to be easier than the passinearing of the merchant.

Surface anesthesia is sometimes applied to the thesi nucces prior to the introduction of the probe to reduce initiating effect (Henning et al., 1951, Marks, 1937), the question wrises whether or not some of the sparsified reaches the stomach with the saliva and affects the secretic



of acid in it. It is quite clear that distortion of its pelifiis not desirable since most of the procedures are pedmed exactly for more accurate determination of the setsecreting function of the stomach. Taking this into accowe decired to study the effect produced by surface and them of the oral part of the throat on the acid-sectiffunction.

Using a three-channel pH-probe and gastropolygraph ti pH of the body and intermediate and antral portions the stomach was continuously recorded. After the reed data of the acid secretion were obtained, 0.2 to 05 ml 2 per cent dicame solution was sprayed by mems of hand pulverizer over the visible part of the patient's three and the gastropolygram was recorded for snother 20 to minutes The result of the examination of 61 patients show that spraying of such an amount of dicame solution of the oral part of the throat does not essentially affect dynamic of changes in the pH of the body and intermedia and antral portions of the stomach. Thus, surface anaesta sia of the throat mucosa with up to 0.5 ml of a 2 per c dicains solution may be applied to facilitate the introde tion of a probe into the oesophagus, stomach or duodent of easily excitable patients

### Position of the Probe in the Stomach

When we study gastric juice by the aspiration and tration techniques we usually introduce the tube to a 6f of 55 or 60 cm and assume that its end olive is in the pilot antrum. But this is far from being so We were convision of this after conducting the following examination on 15 patients.

A three-channel pli-probe of the property of the property of the probe, was set at from the end pli-olive. The probe was the mark and its position in the stem X-ray. Contract of our expectage of the proper posity of the property of the

ediate pH-ol



# 10 X-ray of patient B A Correct position of a three-channel probe in the stomach

ing positioned higher than the autral, while the body il-dive located above these two (Fig. 10) In 559 patients 9.5 per cent) the probe was properly directed but the Ve had all the probe

the stom-It stands



lig 11 \ ray of patient h. Three channel pH-probe is bent in b

to reason that the probe should be introduced deeper insthemic patients or in patients with gastroptosis than a persons with a normal or elevated position of the stomach

It is quite obvious that unless the probe is in the profposition described above, all its pif-olives will not be located in the gastric portions for the examination of which they are intended Consequently, all other positions of the probe should be coasidered faulty. The most common type of improper position is one with the probe bent in the region of the fundus of the stomach (Fig. 11). It can be assumed that this is promoted by an elevated and cascade stomach, perigastic adhesions, and also by tumours of the stomach and neighbouring organs. It is very difficult, or even impossible, to obtain the gastric contents (so-called empty atomachs) when the probe is bent here because its end, instead of being in the antral portion of the stomach, is peatioused shove the level of the gastric contents.

There are other types of faulty positions of the probe, besides the above-described bending in the region of the fundus.

When it is found that the position of the probe in the atomach is wrong, it is necessary to correct it For this purpose the probe is pulled out under control of rearingeno-scopy up to the level at which the oesophagus is continuous with the asterior abdominal wall relaxed, the patient, breathing deeply, again swallows the probe. An improper position of the probe can often be corrected with the patient lying on a sofa in this case the probe is pulled up to the level where the oesophagus is continuous with the stomach, then the patient lies on the sofa on his right side or pack, and swallows the probe slowly. Sometimes the probe may be set as the correct position by Sometimes the probe tis a visit is a tax when it as being swal-

We were able to correct the position of probes in 483 patients (31.2 per cent) by this method. In 28 cases (19 per cent) we failed to introduce a three-channel probe in the correct position.

X-ray control over the position of the probe is now the most precise technique. There are several indirect signs settlying to correct positioning of the probe in the stomach. Thus, satisfactory flow of gester's contents during fractional evaluations of the probes of the desired probability of the stomach of the probes of the probes of the stomach of the probes of the stomach of the probes of the pr

termediate (body) olive, it can be assumed that the procupies the correct position. But in some patient bis no difference in the pff values of these gastine periods in which case this method cannot be applied Thus, in precise study of the medium in different parts of the wysg gastro-intestinal tract, X-ray checking of the probe is correctly the most reliable method.

Steel Mandrins for Easier Introduction of the Tube into the Duodenum

The shortcoming of introducing a commonly used a special duodenal tube is its deformity (twisting) in tregion of the fundus of the stomach be a result of which in X-ray shown, it cannot pass into the duodenum. In other

sage in the region of the fundus. The general firmness is the tube cannot be increased since this will hinder its entr

into the duodenum
To eliminate this drawback we proposed (Berslash st.
Leja, 1972) steel mandrins (Fig. 12) which are inserted
into the tube before it is swallowed. The mondrins at
made of steel wire with a diameter of 0.4 to 0.5 mm as
130 to 180 cm leng. They have thickenings on one end if
easier insertion into the tube and avoidance of dams;
to it, and a handle on the other end for withdrawing the,

Hefore the procedure, two or three mandrins are when the six of th

separately by as histone and patient out by 5 cm one all snother. The number of grooven in the handle shows which of the mandrins has been pulled out more than the other. The patient then lies on his right side and slowly awallow the tube 5 cm deeper. The mandrins are pulled and more, the tube is swaped to the proper and after the datas are taken out.

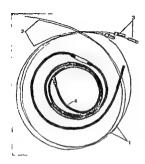


Fig 12. Steel mandrine and duodenal tube

The results of the studies showed that application of ried mandrins shortens to less than one that the time Speat on intubation of the duodenum. Short-term X-ray Control over the position of the tube with the mandrins in it after it has been advanced to a depth of 50 to 55 cm, where

e tube



interior is preferable because the examiner cannot slways beform 30 manipulations within 15 minutes by the routine

The party of the same program of the same of the same

During group examination of the grafits acid-secreting uncited means of a pectable pH-meter the probe of white m connected to one of the nine or ten operation.

Siedy of Gestric Aeld Secretson by means of the Portable PII-Meter, Acidimechanograph and Gastropolygraph

to your

authority can be assessed to the patients at the patient of set in the patient of the patient of the patient of the patient of the patient's department of the patient's department of the patient and work period of the interest patient of the patient patient of the patient patient of the patient patient of the patient of the patient patient of the patient patient of the patient patient of the patient p

eccessions, in whom select, in whom in patients with (acute gastritis, select a sudding the patients and pati

(1924) and used during gestioscopy. Its value depends on a number of 18 cots; the forest and airs of the exametr, condition of the nuncoas and its reception; exception; exception; publication; etc. Nevertheless, in studying

cording apparatus (the latter is preferable sine no need to watch continuously the changes of the integrative medium is recorded for ten min cases when integrative DH is less than 2.0, the mit is pulled out to the marker and continuous receive the pH of the above-mentioned oesophageal per carried out for 15 munutes in a sitting position.

the pII of the above-mentioned occophageal performed carried out: for 55 mnutes in a sitting position the next 45 minutes in a supine position. During the effect of deep respiration and pressure applied epigastrium on the dynamics of the occophageal studied. Patents with a weak alkaline, neutrial acid intragastric medium (pH2-2.0) are given 200 a 0.1 N hydrochlorus card solution to drink. The 8.

and a Nydrochloric and solution to drink. The as is prepared in a pharmacy. Five minutes later the segain pulled out to the mark. The study as further out as described above. The examination cashles whath continuously and sumultaneously the pil of in the separate portions of the cosophagua. The shift is cophaged pil from neutral to and indicates regardiate the occupancy of the acting castric contents. Thankers in the different occopingcal portions show to of its segments the gastric contents are regurgitated the pallent is lying down or standing. The intensity rolls is established according to the lowest pil vin the degree of the gastro-cosophagual rolling, with state of the cost of the cost of the pallent is the strong position, according to the pil state of the gastro-cosophagual rolling, with state in the given position, according to the pil state of the cost of the gastro-cosophagual rolling, with state in the given position, according to the pil state of the cost of the

of its segments the gastric contents are regurgitated the patient is lying down or standing The intentity redux is established according to the lowest pill visual the degree of the gastro-escophages roflux, with patient in the given position, according to the pill is the set discretion in the abdominal, retroperiorally is the segments of the occophagus reguested of the medium an extran portions of the slow law of the content of the conte



conding apparatus (the latter is preferile !! no need to match continuously the charefully the intragacter medium is received in the cares when integrately pll is less thin 20,100 is pulled out to the marker and continued the the pit of the above-mentioned complaint carried out for 15 minutes in a sitting paint the next 15 minutes in a surject position furnity the effect of deep respiration and present at epigastrium on the dynamics of the corp. studied l'atients with a weal aliable, grand acid introgastric medium (pli>20) are \$772 a 0.1 K hydrochloric acid solution to drink In is prepared in a pharmacy. Five minutes lite, is again pulled out to the mark. The study it i-. out as described above. The examination watch continuously and simultaneously the Pile in the separate portions of the oesophagus. The se oesophageni pli from neutral to acid indicate me into the oesophagus of the acid gastric contests changes in the different ocsophogeal perilogs slov of its segments the gastric contents are regard the patient is i) ing down or starding. The must reflux is established according to the lower and the contained according to the lower ac and the degree of the gastro-ocsophageal refut, patient in the given position, according to the in the acid direction in the abdominal, retroper

aortic segments of the oesophagus. Study of the medium in certain portions of the two- or the medium in certain portions of the A two- or three-channel pH probe in fixated in tunder X-ray under X-ray control in a correct position and its different position and it its different portions in a correct position and on a fasting atomosis is then simultaneously at the simultane on a fasting stomach and under the effect of a cost stimulant or an action and under the effect of a cost stimulant or an action and under the effect of a cost stimulant or an action and under the effect of a cost stimulant or an action and under the effect of a cost stimulant or an action and under the effect of a cost stimulant or an action stimulant or an agent blocking the acid-screing the Such a study state of a cid-screing the scid-screing with tus Such a study, especially when combined with a study, especially when combined with the combined with the study of the examination, makes it possible to obtain information the intragastric mass. the intragastric medium in the region of the path process (ucler, polyp, cancer). At the same time and tion and maximum on the character of gastric section and maximum on the character of gastric section. tion and maximum acid secreting capacity, while casential importance for non-surgical and surgicial Other authors also applied prolonged examination of the rid-secreting function of the stomach Intragastric pH-metry opens up new perspectives. The issribed method of prolonged study of the acid secreting,

integratific pit-metry opens up new perspectives the lescribed method of prolonged study of the acid secreting, seatralling and evacuation functions of the stomach by means of a pit-mirroprobe is of particular clinical importance of the stomach with the company of the company

from other methods, this method yields more exact data much reflect the daily rhythm of ead secretion in the stomach. Hence purposeful correction of the disturbances of this function becomes possible.

## Chapter 3

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Gastric Acid Secretion according to the Findings of Intragastric pH-Metry

of the gastric glands. As is known, the initial state b judged by the data obtained at the beginning of the tion are The contrac and ex-Dubras I Intraperime gastric medium to be the normal initial state. Others (Br ron, 1963; Menshikov and Belousov, 1968) found hydrochloric acid in the fasting stomach of healthy people. Acid medium of the gastric contents was often found in health monkeys, pigs, dogs, rabbits and guinea pigs during experimental study of the initial state of the gastric glands An acid reaction of the gastric contents at the initial state was revealed more frequently in patients with peptic ules and other disorders of the digestive tract than in healthy people and experimental animals (Atalbanov, 1967 and

Extensive study of basal gastric secretion became possible with the secretion became pos-

alarly in those with peptic ulter of the duodepunt

confirmed

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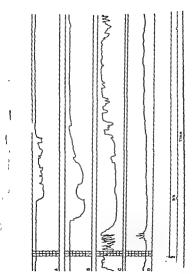
diseases.

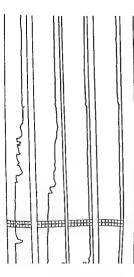
To evaluate objectively the acid secreting function of the stomach it is evential to know the normal initial state It was assumed that this phenomenon is a consequence of tolic activity of the vagus (Dragstedt, 1967), which finds confirmation in most patients, for instance, the secretion reactions of the stomach dimminded after vagotomy. At the same time the considerable influence of homoral factors (bitsunine and histamine-like substances) should be borne in mad

In intragastric pH-metry the initial state of the gastric glands in characterized by the pH values at the beginning of the examination, before any stimulation of gastric receptors. To reveal whether or not the initial state changes due to the effect of the pH-probe steelf, e g during correction of its position in the X-ray department or during other manipulations lasting for 45 to 20 minutes, we carried out the following study A three-channel pH-probe of the gastropolygraph was introduced into 139 patients without X-ray control The gastropolygraph was switched on immediately the olives of the probe had reached the oesophagus. The probe was then advanced into the stomach to the mark and the initial state of the gastric glands was recorded for 30 minutes without using any stimulants. The initial state of the intragastric medium was found to be acid in 97 cases and neutral or weakly alkaline in the remaining 46 cases, in 123 cases it did not change throughout the whole period of observation. In ten patients, however, the acid intiagastric medium was marked by a shift in the alkaline direction during the investigation and in six patients the beginning of gastric-acid secretion was noted on the background of neutral or weakly alkaline medium. These changes usually remained within the limits of pH 20

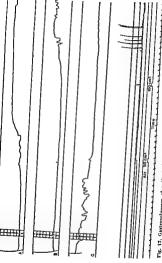
It is known that in the period of rest after activity which causes diminution of functional capacity of organs the normal functional reserves of a gland or fully restored quite rapidly. The periods between digestion are the pe-

and easily tolerated procedures are carried out with the tube or probe early in the morning in every-day clinical





ig 16, Castropolygram of patient B. The same designations as in Fig 15



s portions C, pit of the prioris antrons Fig. 17. Gastropolygram,

practice, however, in heightened excitability of the gastric glands, the stimulating effect of the tube and the conditioned food reflexes should be taken into consideration since the acid-secreting function is usually examined later than the habitual time of breakfast

We have discussed two types of intragastric media on a Wath discussed two types of intragastric media on a Wath ground, and and neutral, or weakly alkaline, but this which have been recently obtained as the Disgroution Department of the GED showed that the dynamics of charge the properties of the pr

1 Deeper 408 communication of agreement of the document

... Among 135 patients subjected to combined examination of

Among to patients subjected to combined examination of

th order to study the nature of continuous acid secretion we conducted ten prolonged studies by means of the pit-microprobe Washam,

may indicate that the pH-probe has not reached the required described to the gastroodyzama, however, was found in 2.1 per end of the printed as with correct positioning. If all the probe coffeed the printed control of the printed printed by execution of the acid gestine contents into the danderson.

These four observations show that the initial state of the introgastric medium is not always consist. It my change both in the acid and in the alkalino direction, it other words, we often have to deal with a cycle-dented of the acid secretary function in appraising the initial test of the gastric glands. This is clearly shown to the set of the gastric glands. This is clearly shown the first of the gastric glands. This is clearly shown to the state of the gastric glands. This is clearly shown to the following the control of the state of the gastric medium in the pyloric antum (four document of the state of the gastric glands) and the commentation was begun, the properties of the grands of the g

## Stimulants of the Acid-secreting Apparatus of the Stomach and Agents Blocking It

Numerous test and parenterel stimulants of gastric and accretion are currently used in medical institutions for recearchers emphasize the advantages of precisely the particulant they use. Among the test stimulants cabbageware which possesses a strong secretagogue effect has well by widest recognition. The effects produced by alcohol as caffeine stimulants, meat broth, peption meal, beclared bread-water, finely ground rasts, rasks-nater, if per ceitarily (Sciene stilled) flusion, gazeous stimulant, pestigreen-tes decoction, combined atimulant (alcohol +vanila +vayar), herr and others are also considered to be it woursalte. At the same time it should be taken into consideration that the liquid test stimulants which such as a sideration that the liquid test stimulants which accurrently widely used in clinical practice have certain evential faults.

First of all, they do not always have the same and constant composition, it changes depending on the quality of the substrate from which the test stimulant is prepared,

Secon on the

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sch of a person who has never taken alcohol and on that of a person who abuses it. The same applies to the caffeine stimulant. There are all grounds to presume that the action is meat broth (as well as cabbage-water) in people who often set meat will differ from that in vegetarisate.

Third, test stimulants dilute the gestric contents and thus artificially reduce intragastric acidity. This factor is often decisive, as gastropolygraphic examinations show, in erroneous evaluation of the acid-secreting function of

the stomach

It is quite clear that the shortcomings of the test stimulants considerably limit the reliability of the result. obtained. Mechanical stimulation of the stomach with a balloon, complete aspiration (in a certain time interval) of an introduced test stimulant, and parenteral injection of stimulants of the scid-secreting apparatus of the stomach were suggested to improve the quality of the study and to obtain pure gastric juice Preference is given to and to obtain pure general practice. histamine, hista-parenteral stimulants in clinical practice. histamine, hista-gol (betaxole), tetrapeptide and pentapeptide gastrin, ingol (betazole), tetrapeptus in histamine test with injection of 0.01 mg/kg histamine is most commonly used Some of 001 mg/kg histamine authors recognize the advantages of Kay's maximal hisauthors recognize the 0.04 mg/kg histamine phosphate tamine test in which however, that this test often proinjected Others note, not out of place to mention here duces side effects is also not infrequently poorly tolerated by the patient, who may even fall into a poorly tolerated by the group of 583 patients whom we obcollaptoid state in a gaved histamine poorly. Taking into served 2.1 per cent tolerand data, and our Taking i

nal tract, hypotension, marked hypertension, for those with a tendency to develop allergic reactions and bronchospasm and also for patients at the age of 65 to 70.

It should be stressed that test and parenteral stimulants differ in the mechanism of action on the acid-secreting apparatus of the stomach Thus, the insulin test is used to study the first phase of gastric secretion and histamire, the second phase The humoral effect of histamine on the parietal cells differs essentially from the effect produced by the test or mechanical stimulant (through the receptor apparatus of the stomach). Nevertheless, the use of the test or mechanical stimulants makes it possible to form an opinion about the intensity of gastric acid secretion during d' in turn.

acid-secr

that the

one another and are equally important in the examination

of the patient.

We may note that most researchers, by using various test and parenteral stimulants, strove to influence the sold-secreting function of the stomach attaching no significance to the methods of its study. There are many test and parenteral stimulants and methods of their application but the technique of the assessment of the results obtained in clinical practice remains unchanged (titration method).

pil-Metry of the stomach allows a new qualitative sp-

patient.

Histamine usually causes a more intensive secretory reaction of the gastric glands than that excited by test stimulants (levine et al , 197' We became convinced this on comparing the et ie routine histamine a' at tion during go with that of dozed . "ats. The history polygraphic

however.

mum acid-secre

espectly of the gentic glands, therefore its application in all patints is no justified. In ceases with initial weak-sikine, neutra is not justified in ceases with initial weak-sikine, neutra is not provided to the control of the patients being studied, or apply mechanical stimulation. This gives an idea of the functional site of all the reflex and humoral links participating in Salira and secretion (the receptor appraxias, afterent and detent nervous pathways, gastrin producing system), and offerent nervous pathways, gastrin producing system).

The application of the histamine test for determining the maximum acid-secreting capacity of the stomach is justified only in persons with anacidity or with mild intragestric acidity in whom a stimulant identical with food

in qualities had been used.

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To improve the method of studying the acid-secreting function of the stomach, beginning with 1992, when gastein was first being from the plyeric anitum mucosa (Gregory, 1991; Gregory and Tracy, 1994), work has been carried out to produce the synthetic preparations devoid of the undesirable side at synthetic preparations devoid of the undesirable side at synthetic preparations devoid of the undesirable side at local tender of the state of the s

erries method in 23 experiments on cours does the than reason of the course of the cou

Juice was secreted in response to pentagastrin

We carried out jointly with S Sauja the peniagastrin Ve carried out jointly with S Sauja the peniagastrin test on 105 patients, using the pentaled OP-2 pH-meter depends were examined twice (the histamine test was applied in the first examination and the peniagastrin test in the second). Histamine by decollered was injected gub-

cutancousty in a dose of 0.01 mg/kg and pentagastin is a dose of 6 mg (0.000 mg) per 1 kg of body weight body and antral pil proved to be lower in patients after the hastannie rest in all the of gastric acid secretion studied. Pentagastin reduced the intragastine pil to low figures more often (p>0.00) the histogram and led to more marked acidity of the plen antrum.

As a result of the studies conducted it was found by
the pentagestran test in the recommended doe (6 mech
has a stronger effect on the acid-accreting apparitive
to the stomach than the routine histanian test. The patient
tolerate the pentagastran test well. It practically does not
produce any sude effects which is very important in
clinic. The absence of contraindications, which do evifor histanians, considerably widens the possibility of units
to pentagastran test in the clinic to determine the main

rum acid-secreting capacity of the stomach.

Practice shows that when the examination is carried

out in the morning the

tus of the stomsch by stimulant practically

the pil or does not at Such studies yield neg. ;

Such studies Jield neg. 3 into account what is said above, we arrived at the corclusion that in patients with continuous and servition of high intensity (the initial integrative pII below 2.0) the high intensity produced (to 15 minutes) with practically be considerably reduced (to 15 minutes) with practically in such cases the examination may not be simply limited to the study of the initial indices, but additional information may be obtained on the acid secreting function of 12ctorach by using the alkalian test (Parisyeve et al., 12-2).

An alkali to introduced into the atomach through a tule and the degree to which the intragastric pil introduce and the time when it returns to the initial values are marked

The possibility of using atropins so a disgnostic and prognostic test was studied in gatients with continuous entric acid secretion of high intensity in the Disgnostics

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Department at the CGED (Danilans and Leja, 1970, Skuja and Danilans, 1973). The patients were examined by means ter using a two-

m the initial in-. ml of an 0.1 per

tent stropine sulphate solution was injected subcutaneously and observation was continued for another hour The efficacy of the atropine test was estimated according to the increase of intragastric pH as high (above 20), medium (from 1.0 to 20), weak (from 0.5 to 1.0) and negligible or negative (0.5 or zero) Treatment of the data obtained from 64 patients showed that the atropine test was less effective in patients with duodenal ulcer than in those with other diseases of the gastro-intestinal tract It was elso noted that this particularly applies to 'the neurovegstative variant of ulcer' The efficacy of the atropine test proved lower in clinically pronounced hypertonia of the

vagus than in its normotonic state.

Combined use of cholmolytics, antihistaminics and gar glion blocking agents causes a stronger blocking effect o. the acid-secreting function of the stomach. The combinaiton of atropine and sulphate with pipolphen (promethazine) ind hexonium B proved to be the most efficacious among the 30 combinations of the above-named agents used by as. Even this combination, however, could not arrest conlinuous gastric acid secretion in any of the patients Cautious use of ganglion blocking agents should be emphasized due to the danger of the development of orthostatic hypotension, especially in out-patients

In every-day practice we use the stropine test The re-sults obtained yield valuable prognostic information on the expected efficacy of the action of cholinolytic agents

on the acid-secreting gastric function.

In concluding the discussion of sgents which stimulate and those which block the acid-secreting function of the stomach, we consider it expedient to stress again the need for an individual approach to its study. Only such an an-Proach is up-to-date and logical. It stands to reason that it is necessary to have exact data on the intragastric medum during the examination (and not after it is completed and the pastric succe is tstrated). plf-Metry of the stomach in this respect is the most modern method of study. But due to the lack of special apparatus and pH-probes it is

not used at all medical institutions as yet.

It is reasonable to use the above described principle of being orientated as to the acidity of the gastic just from the very beginning of the examination. For this perpose slips of indicator paper, the express method for determining the pH in the aspirated portions of the gastric juits and even the titration method can be applied

## Evaluation of Gastric Acid Secretion

As soon as pH-metry was introduced into clinical practice, the problem concerning the assessment of the data obtained and the interpretation of the acid-accreting function of the patient in the process of the examination arose. The old system for appraising the formation and secretion of acid in the stomach proved unacceptable since it takes into

ever wider in Soviet medical institutions for group estable nation of patients if provides characteristics of both the intensity of the acid-secreting function of the stomach and the dynamics of changes in the intregastric medium in the process of study, its main purposes is to obtain all basic information (sometimes not appreciable immediately) on the functional state of the stomach.

The method being described includes eight types of evalnation of the functional state of gastric acd secretion five of them are characterized by neutral or weally alkalise intragastric medium in the initial state and the other three

by acid intragestric medium.

As we have already mentioned, a neutral or weakly alkaline intragastric medium should be considered the nor mal initial state of the gestric glands of a healthy individual, at this time the acid-secreting apparatus of the stomach is in a state of physiological rest When on such a background the gestric receptors are stimulated by a

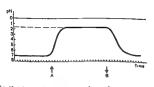


Fig 18, behamatica) representation of normal secretion of add in the atomach

A, beginning of stimulation B, and of stimulation

a, organizing of stimulation B, and of stimulation

stimulant which in its qualities in close to food, then, with the acid-secretion capacity being preserved, the integrating bill changes from alkaline to acid, i.e., the decrease.

Acid secretion in the stomach in considered sormal when

Acid secretion in the stomach is considered normal when during the action of a stimulant which in its qualifies is close to food the pil becomes less than 20 and many

Matric engines was optimum in two pli 1000 of 1.5-2.0, friend in experiments which we condensity was confirmed in experiments which we condensity was confirmed in experiments which we condensity was confirmed in experiments which we condense with the work of the experiment of the property of the experiment of the work of the experiment of the work of the experiment of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal to a short examination of the bioptic material metal and the short examination of the bioptic material metal and the short examination of the bioptic material metal examination of the bioptic material

in these cases that the stimulating of eridently

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the conditioned food reflexes of the person under stally should be taken into consideration. The atropine test will be usually effective in such cases shows the refer rature of the phenomenon described. The functional state of the stomach in these patients is estimated as that with normal

and secretion and heightened excitability. The evaluation of normal and secretion is somewhat conflictated by the following circumstance. In some patients with normal acid secretion the medium in the tone of the acid-accreting glands is not stably acid during stimulation of the gastric receptors, the plf of the body rises for a situations showing, as it were, the incapacity of the acid-accreting glands to perform highly effective work. The functional state of the stomach in these cases shown as for application of the acid-accreting glands. As the results of the stomach in these cases shown as for application of the acid-accreting glands. As the results of the stomach of the state of th

There may be patients with a weakly acid intragastric

after exposus

of the test

does not remain constantly acid but has a tendenty, it thangs in the alialme direction testifying to exhausted of the acid-screting glands. As a result there seems to be assumitanceously, with exhaustion of the acid-screting parature, which is illegical. The morphological shifts in better more than the control of the co

in These cases with normal acid accretion and exhaustion of the acid-accreting glands are actually related to another type of acid-accreting function according to the data of intractivitic pil metry, to diminished acid secretion in the atomach. This type of acid-accreting function, just all normal acid percetion, is characterized by a neutral or weakly

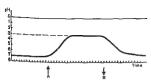


Fig 19, Schematical representation of diminished secretion of acid in the stomach. The same designations as in Fig. 18

sikaline initial state. During chemical or mechanical stimulation of the gastric receptors the pH changes from alkaline to acid but does not drop below 20 (Fig. 19) and does not reach the values of normal gastric acidity. After stimulation is ceased the introgastric pH again increases fradually. The heavy limited of the company of the

The incapacity of the gastric glands to produce hydrothloric acid is now called by most authors achierhydria g the results of titra-

In intregastric pli-

which whose range of the pix changes in the stomach (from 0.8 to 8.0), it would be more correct to speek about the absence of the acadescretting function of the stomach only in the presence of neutral, weakly alkilation or relative. It weakly seed intragastric medium, when the pill of the hitzgastric contents does not drop below 60 (Krentz, 1906, Keel, 1965) In this case the term "achiorhydria" is not appropriate same not in all cases of weakly acid in the propriate same not in all cases of weakly acid.

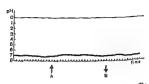


Fig. 20. Schematical representation of gastric auscidity The seeingnations as in Fig. 18

absence of all acid valencies capable of producing a wet acid intragastric medium it is more appropriate to hav mind anacidity. Achylia is a state in which the gas glands are not capable of producing both acid acid expan-In patients with preserved acid-accept appeals the stomach the untragestric pH during attendation marked by a shift in the acid direction in California in

inte stomach the intrajestric per during sames par marked by a shiri in the acid drection in climater as a test stimulant often reveals anaeddry. During the color rest stimulant is given to the same patient ecret of acid in the stomach occurs it stands to rearedly such cases one cannot spok of real gestim cardity and the stomach occurs in the stands of the cardity acid its may be recognized only as that readed with acid in the stands of the stand

The preliminary data that we have at our daposal shat in evaluating the reaction of the and-excetting glas by integratine pil-metry the maximum done of listent is not necessary, but for revealing complete atrophy of gastric nuces a the routine hatamine test is not sufficient the properties of the pr

of bistamine. We use the routino histamine text in everyday practice after determining amountily or weakly acid in transitive medium under the effect of a stimulant which is similar in its qualities to food. Then we record the intragistic pill for an hour and only in the absence of an and shift of the pill we recognize true or histaminerfractory gastric anacidaty. It is exactly the term "histaminer anacidaty that should be recognized as have more suitable for designating true smandily than the properties of the organism anacidaty deliberation, the formation of the organism to pathogenic effect, while the resultance of the organism to pathogenic effect, while

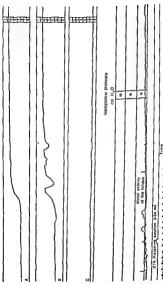
The anacidity is determined less frequently than the other types of gastric and secretion by the pH-metry methods Olten, after obtaining an anacidity curve, e.g. in mechanical simulation, histamine injection causes obvious thage of intragastric pH from alkaline to acid, indicating stid oroduction.

The gastropolygram of patient \ (Fig. 21), for example, shows that the pill in the body and intermediate portion of the stomach thanges from alkaling to said in three and a half minutes after injection of 0 54 ml of a 0 1 per cut histamin solution

With a preserved accid-secreting function of the stomach the period of num between the injection of battanine and the beginning of the pH shift in the acid direction differs in the patient. The degree of shange of the register of the pH shift in the patient of the pH shift in the patient of the pH shift in the philary of the philar

In patient B (Fig. 23) the pH of the infermediate gastric portion changed from alkaline to and 14 minutes after histamina injection but did not reach the value of 2.0

pil of 5 0-6 0 should be considered the lowest limit at which the stomach still preserves its capacity to secrete



big. 21. Castropolygram of patient V The same

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			antitud pressure		Ц	111	
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	111		- 11	П			13 31
	111		N				- E
			1			940 DE 240	"t. II tare prigram of pollest V, The same designations as in Fig. 57
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acid (Ewe and Weis, 1968). At first glance it seems that to acidify the gastric contents to such a weak acid medma (pH 5 0-6 0) an insignificant, of no practical importante amount of acie

stress the hufl that a rather

pH from 7.0 to 4.0 or 5.0 Consequently, the syresecreting function of the stomach, i.e. preserved secretor, capacity to the limit of diminished or normal acid secretion have great practical importance.

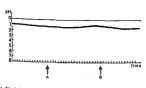
A comparatively lengthy conclusion on gastric acid st cretion such as 'preserved secretory capacity of the stomac to the level of normal acid secretion is aimed at makin it clear to the attending physician that gastric acid secre tion in the patient is preserved to a normal level but the this is abnormal acid secretion. In order to stress the sential difference between the types of gastric acid secrition it is sometimes expedient to note, 'after the histi mine test'.

As it was already noted, normal acid secretion is observe only when the reflex and humoral apparatus regulation acid secretion function fully, while the preserved capacit of the stomach for secretion only shows that the parieti cells are capable of secreting hydrochloric acid under th effect of a humoral stimulator, histamine. In the latti case no other conclusions can be drawn there are no ground for accepting that since acid secretion was revealed in the patient after the histamine test it will also take place during

the digestive process, as it happens in normal acid secretion We have already discussed the types of acid-secretin gastric function with neutral or weakly alkalino initia state of the gastric glands. Now it is necessary to dwe on acid secretion in patients who have an acid intragastr - - - dot

pH, this continuous secretion has three types:

(1) continuous acid secretion of heightened intensity (u. tragastric pH 0.8-1.5).



lig 23 Schematical representation of continuous gastric acid secrelon of heightened intensity The same designations es en Fig 18

(2) continuous sold secretion of medium intensity (intragastric pH 16-20) and (3) continuous acid secretion of reduced intensity (in-

ragastric pH 2 0-6 0).

Continuous acid secretion of heightened intensity is chaacterized by an acid initial state of the gestric glands (Fig. 23), during stimulation of gastric receptors the inregastric pH does not change essentially. When the stimalation is discontinued the pH remains in a strongly scid zone. Continuous acid secretion of medium intensity, as well

m that of heightened intensity, is encountered rather frequently. The intragastric pli curve is the same, in principle, as that of the heightened type of continuous acidsecreting function. The intragastric pli values of continnous acid secretion ill medium intensity during the examhation correspond to the level of normal scid formaion in the stemach during stimulation of its acid-secreting apparatus. It m necessary to point out the essential difference between the discussed types of gastric acid se-tretion. Normal acid secretion in recognized in patients with a neutral initial state, while continuous acid secre-tion of medium intensity is marked by an acid initial state. i.e. by the continuous activity of the acid-secreting plands from the very beginning of the examination.

Continuous acid secretion of reduced intensity is mailed by a weakly acid intragastric medium during the study (pH 2 0-6 0) The acid-secreting apparatus of the stunkte cannot produce juice ions, though some of functional stores of t

of the histamine test
the effect of histamine in the presence of functional store,
but hardly changes in their absence. The conclusion she
the gastric acid secretion in this case is formulated be
the gastric acid secretion in the stomach of reduced
lows. continuous acid secretion in the stomach of reduced

intensity without functional stores

It was pointed out above that hydrochloric acid can be produced in the initial state in normal acid screttlin in produced in the initial state in normal acid screttlin in cases with heightened excitability of the acid-accreting apparatus due to the stimulating effect of the probe red conditioned food reflores. Consequently, the character of these in continuous scientiar to the character of those in continuous scientiar to the character of those in continuous acid activation of reduced intensity llow can these types of earlier to the continuous of the continuous activation of reduced The asswer to this question may be found more easily by applying test or merchical size ulation under whose action in normal acid accretion intragastic pli noticeably reduces, while with careful continuous acid secretion of reduced intensity such changes are not

observed.

Thus, in cases with a weakly acid integrastric medium both in the initial state and during the effect of a situation, which in its qualities resembles food, it is necessify to check whether there is normal acid secretion. Moreover, a highly acid integrastric medium (pff lens than 20) about the observed in the organizer, all the state of the observed in the organizer of the observed in the observ

A comparison of the functional data of intrapartic pilmetry with the morphological picture of the gastric muces; showed that in most cases with continuous acid secreted of hepkineal intensity the mucesa was unchanged or superficial gentric had developed With the appearance of huctional symptoms of the superficial gentric with the involvement of the glands increases. This regular patters was also noted in cases with continuous and secricial medium intensity. At the same time, gastritis with the involvement of the glands was disquosed in most of the patients with continuous acid secretion of reduced intensity. Normal gastric mucosa was practically not encountered in reduced acid secretion with acid-secreting ca-Petilip preserved to values of normal or reduced and se-

cretion and in histamine-refractory anacidity In joint studies with Chernobaeva and Kalinka, we found that the effectiveness of the atropine test grows with the appearance of symptoms of exhaustion of the gastric scidsecreting glands. This phenomenon occurred in cases with continuous acid secretion both of the heightened and of medium intensity. The parallelism was also observed when the effectiveness of the atropine test was compared with the morphological structure of the gastric mucosa. Thus, in patients with continuous acid secretion of heightened intensity and normal structure of the gastric mucosa the atropine test was usually negative or weakly positive, in those with superficial gastritis weakly or mildly positive. while in patients with gostritis with involvement of the glands it was mildly or sharply positive. Thus, the effice. tiveness of the atropine test increases both with the more a.

with the state of a certain exhaustion of the state secretion apparatus of the stomach Histological material selecting above that the structural shifts in the gattle obtained ing this type of acid secretion are procounced in the trace of the state of t

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continuous acid secretion of medium intensity to be a form of partial exhaustion of the acid-secreting glands

The frequency of the types of gastric acid secretion discussed is confirmed by the results of examination of 2000 patients at the Diagnostics Department of CGED (1972) continuous acid secretion of heightened intensity was revealed in 710 patients, of medium intensity in 353, of fused intensity in 226, normal acid secretion was found in 310 patients and reduced in 209, preserved secretic espectly of the stomach to the level of normal acid secretion was determined in 37, and to the level of reduct acid secretion in 50 patients, and histamine-refractive acid secretion in 30 patients.

anacidity was revealed in 49 patients.

It should be noted that not all changes of intragastric plrevealed during examination can be fully evaluated by the types of gastric acid secretion discussed. In such cases it character of the pill dynamics should be described. For example, in some cases continuous acid secretion determined in the initial state cease of itself without the application of any agent stimulating or blocking the acid-reting apparatus and then, in a certain period of time, recommences Such a type of gastric acid secretion is usually observed during long-term studies. We believe this fine statuating it both the intensity of the acid-secreting function and ats cyclic or phase process should be reflected as g. cyclic gastric acid secretion of heightened intensity



The basic method for evaluating the acidity of the significance of scalarin percent in the price of two indicates of scalarin percentage in the presence of two indicates, discussed in the presence of two indicates, discussed in the presence of two indicates of scalaring percentage in a contract of shortcomings inaccurate indicator, maccuracy of the titration and of the methods of preparing and storing the solution used for titration (Linar, 1905). Certain sufficiently doubt the value of determining free hydrochloric acid, and consider the terms "free" hydrochloric acid and "cidity to be obsolete and recommend that they not be used (Moore and Scalatas, 1905, Keel, 1907).

For better evaluation of the aspirated gastric juice, i' tration with phenol red or under control of a pli-med is used in certain clinics. But these methods are also a quite adequate because aspiration of the juice is limite.

Measurement of intragastrue pH is a new method of studin principle and as aimed not at analysing the aspirat gastric junce but at determining the intragastric medium Teleradiometry and actidimechanography should be meution among the methods used in our country for determining the pH. They makes it possible to watch continuously the change of intragastric pH during the examination and to deter all its short-lived changers which are not seen when the five true contents are collected by the fractional method.

Thus, the methods of studying the seld-secreting fartion of the stomach have been developed in the follows way one-stage examination by the float-Exail technique fractional aspiration of gastric judee, methods of obtainpure gastric purce, titration of gastric judee with pheared or under control of a pil meter and, finally, determine tion of integrative pil All these methods are now under the clinic and their tendency to improve is developing to this way.

The results of titration in 27 laboratories of Biggs at a student outsides proposed according to the range of tregestic pill changes from 4.0 to 80 showed that for hydro Hotels and 10 determined only in highly sold gotter extents with pill of 2.5 and lose 1 a standard soldier, with pill 3.0 and lose 1 a standard soldier, with pill 3.0 and lose 1 a standard soldier, with pill 3.0 and lose 1 a standard soldier, with pill 3.0 and from 1 a standard soldier, with pill 3.0 and more it was not revealed buch results.

a the presence of dimethylamano azobenzene indicator with the dye beginning to pass into the solution when pH is 2 9 It is easy to understand why after the examination gas-

the anacidity is diagnosed in patients with a weakly acid medium in the pyloric sutrum where during fractional study of the stomach the tube clive is located Therefore. in examination of aspirated gastric juice it is not possible to trace the short-lived and slight changes of the intra-Police medium and the acidity of the gastric juice in samples the pH of which exceeds 25-30. It can be suggested that this partly explains the large number of cases with satric spacidity and heterochylia (Lorie, 1958) diagnosed during fractional study and the frequent lack of coincidence of the results of this study with the morphological Indings and the clinical picture Determination of the pH of the gastric contents by titration with phenol red should he ronsidered more exact, though the results of this method tre also maccurate, because the pH is determined outside

the stomach, where this index may change Intragastric pH-metry is devoid of the above-mentioned shortcomings and justifiably finds wider use in clinics (Fursova, 1972, Belouzov, 1973, Sadnikova, 1973, Sum-lyaninova and Akinfova, 1973) Determination of the pH of one portion of the stomach, however, is not a full-value method for studying its acid secretion in the clinic so it in necessary to study the pH of different gastric portions.

pll of Different Portions of the Stomach

Man 42 ogs

tions : ance

stresso the pyloric portion obtained on a fasting stomach has an ar I lented at dec of it

It was shown that the chief and parietal cells are located in the body and fundus of the stomach, while the pyloric

portion has gractically no parietal cells This portion | lined with pyloric glands consisting of mucous, accessor and chief cells which produce an alkaline secretion. Thus it should be considered as established that the gastric gland may be divided at least into two zones an upper too which is acid secreting and corresponds along the less curvature to the body and intermediate portion, and lower zone, which is neutralizing and corresponds to the pyloro-antial portion of the stomach

The facts established testifying to the presence in the

or weakly alkalme intragastric medium Normai gainacid secretion was found in 110 patients and diminished in 111 patients. The studies were conducted by the three channel probe with olives for determining the medium in the body, and intermediate portion and in the natura. The position of the probe was checked by reconference of

secretion of seed begins in the upper portion it is many so assume that the antrum m 'acidined' by the acid gastric fuice of the proximal acid-producing zone.

When discussing the typer of evaluation of gastic side secretion seconding to the data of integrative pil-metirfor simpler presentation of the material, we only spidabout the pl of one gestire portion, the plf of the selfproducing zone. It is necessary to mention here that the data obtained are more complicated since they character.

and only the intragastric medium in the zone of the acidscreing but also that in the zone of the neutralizing glands la analysing these data it is necessary to consider not only the dynamics of the medium in various gastric portions but the the correlations between them and to evaluate the

baction of the stomach in its entirety. frequently in elaborating for the clinic a new method of fludy or treatment its actual possibilities are exaggerated Eventually, with the accumulation of extensive factual Material, the method does not live up to expectations and a forgotten. To avoid such untimely conclusions in respect of the practical application of intragastric pil-metry, we decided to subject it to all-round clinical checking Wo

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tragastru, pri-metry and by the method of gestric juice

espiration were carried out Comparison of the results of gastropolygraphy with the results obtained by the examination of aspirated gastric Juice (according to the data of medical fustory) The results of previously conducted one-stage or fractional examination of aspirated gastric juice were collected from the medical histories of 1390 patients after guatropolygraphic studies. The results of titration were unknown in 139 patients, hyperacidity during the last three years was estab. luhed in 266, normal acidity in 167, subnormal acidity In 338 and spacidity in 480 patients Continuous acid secretion of increased or medium intensity was established by gastropolygraphy in most patients with hyperacidity revealed by titration This type of acid-secreting function of the stomach was observed also in most patients with normal and subnormal acidity determined previously by titration. Many patients with established anacidity had a neutral or weakly aikalino introgastric medium in the inthe standard of the standard o

i maranama cretion, gastropolygraphy demonstrated preserved acid-secreting capacity

2. In 153 patients the results yielded by gastropoligraphy were compared with the results of previous tests, supplied by clinical laboratories. Among the 62 patients with it tration anacidity confirmed by means of gastropolygraphy histamine-refractory anacidity was confirmed in only fig. 1e in 8.1 per cent of the cases.

The analysis of the results shows that higher acides creting capacity of the stomach as revealed by gastropely graphy than by the method of gastro juice aspiration.

In the group of patients with titration anacidity, continuous acid scoretion of heightened and medium intensity was observed more frequently than histamine-refractor, anacidity.

The results yielded by gastropolygraphy and those obtained by the methods of gastro juice aspiration were compared by the non-parametric test of signs; it proved asimal for the first method to demonstrate higher values. This may ovidently be explained both by the more extensive range of observations over the acid-secreting function factermining the activity of hydrogen ions in general sand by the examination of the pill of various portions of the stomath by gastropolygraphy which provides information on the intragastric medium of both the lower end the upper gastrif portions.

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clinical hospids). The results of fractional tests of gastic secretish were as follows: hyperacedity in 1953-1981, anacdity in 1953-1981 and the first of the condensation of the first of the condensation of the same of the condensation of the same of the condensation of the condensatio

In such a case it is difficult to believe the data of fractional method for the years of 1962-1966.

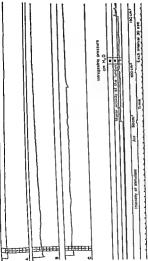


Fig fit Gastropolygram of patient A The same designations as in Fig 17



Fig 25. Gastropolygram of patient K. The same designations as in Fig. 17 Infragasing pressure

The previously revealed regular pattern was demonstrated: gastropolygraphy showed values of gastric acid secretio which were higher, than those revealed simultaneously li the titration method.

Continuous acid secretion of heightened intensity was found by means of pH-metry in 16 patients in whom hy peracidity was established by titration.

According to the data of intragastric pH-metry, norms acid secretion was found in only six of 23 patients with nor mal acidity established by titration. In the other 17 pa tients continuous acid secretion of heightened or medium intensity was revealed

With the application of test stimulants the values of intragastric pH in the group of patients with subnorma. acidity or anacidity established by titration testified to

higher acid-secreting activity Among the three series of investigations free hydrochloric acid was found in the gastric mice in the initial state in 33 patients In the process of study it was established that in most of them the amount of free hydrochloric acid considerably diminished after the test stimulant was introduced. This phenomenon may be explained by the diluting effect of the test stimulant. It was more marked when a 5 per cent solution of ethal alcohol or a calleine stimulant was used In only six patients the amount of free hydrochloric acid in aspirated fractions of the gastric juice did not diminish after the test stimulant was administered. At the same time in another six patients this diminution was so prolonged that the amount of free hydrochloric acid did not reach the initial values 55 minutes after the test stimulant was administered In two of them after administered the test stimulant (in one case cah' , other a 5 per cent solution of ethi-

chloric acid was not found in any of A part of the gastropolygram shown in Fig. 26, from which i diluting effect of dried-cal." strated false anacidity. Th continuous seid secretion More careful analysis (Leja, 1971) showed

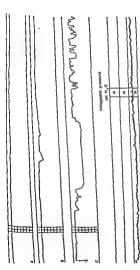


Fig. 26. Gartwoolygram of paternt P. The same designations as in Fig. 17.

the results of fractional study for half an hour and seme times more In preserved gastric acid secretion, and \$50 tric juice flowing from the upper portions of the stemath is neutralized, partly or completely, by the mucus of the pyloric glands and is diluted by the test stimulant remain ing after aspiration. It is not out of place to mention ber that even with X-ray control of the position of the protect

one cannot be sure that the test stimulant was aspirated completely, since without the use of a contrast median it is not possible to establish that the olive of the prote below and not above the gastric contents Therefore, when titration demonstrated a certain amount of free hydrochloric acid in the gastric juice, we must hear in mind that the amount of the acid in the upper gastric portions is much higher When no free hy drochloric acid is revealed by the

titration method one should bear in mind that the preta billity of the gastric seid secretion being preserved in the given patient in still very high 4 It is necessary to discuss the following indices the hour-yield of free hydrochloric acid, the seld and shaller components of gastra accretion, the acid-alkaline cert-

ficient, the hour tension of gastric secretion and the data concerning intragastric pli the advantages of calculating these indices in clinical practice have recently been stress, ed by certain authors in order to check this we examined 200 patients with different acid secreting capacity of the stomach A two-channel pil-peobe with a system for col lecting gastric juice and an OP-2 portable off-meter were used The examination was continued for two hours, bash gestric secretion was studied during the first and secretion after the routine hutamine test during the second hour The hour tension of gastric secretion was calculated from the sum

of the solumes of all gasters juice fractions collected within an hour, the hour yield of free hydrochloric seld was calculated by the common method ("hilov and Fishcon-llyet, ('s 2) and the acid and alkaline components by the Thompson-lane formula (Theriteen and Lane, 1961) Finally. taking into account fustion Ryes' (1964) critical remarks about hontyuk's formula for calculating the acut-allaline coefficient (ACC) we calculated it by using both Amityuk's and fin' rou-ligne' f emulas

Analysis of the data obtained showed that these indires fructically always increased after histamine administration Comparison of the hours yield of free hydrochloric send with the type of gastra aerd secretion, determined by pHmetry, do not reveal any strict parallelism between three hotes.

The hour-yield of free hydrochloric acid was increased in most patients with continuous soid secretion of heightthed intensity and remained within the normal limits in those with continuous acid secretion of medium intensity and in those with normal acid secretion A zero hour-yield was found in all patients with histamine-refractory gastric bacidity. Such a phenomenon may be considered logical but not in respect of patients with preserved acid-secreting fastric capacity A zero value of the hour-yield of free hydrochloric acid, however, was encountered in thom and even in patients with continuous acid secretion of medium and beightened intensity The average AAC values, according to Kostyuk and Fishzon-Ryss, are practically identical in patients with continuous acid secretion of various intensity a well m in patients with normal and diminished acid secretion and with histamine-refractory anacidity

Generalising the data obtained it should be seried that the total the data obtained it should be seried of the mount of both of gastrie and secretion depend on the mount of both of gastrie and secretion flowers. The for example, the hour-paid of free hydrochiours and reacts is hour secretion only when iteration of the gastric ulure shows the presence of free hydrochiours and in the paid of the spirated gastrie juice exceeds 2.5-30, particularly and the produced in the spirated gastrie juice exceeds 2.5-30, particularly and the secretion is often produced in the upper portions of the someth. As a result the free hydrochiour and there is due series in the secretion is often produced in the spirated gastrie that the series is due series in the secretion of the gastrie careful in many consistent of the secretion of the gastrie secreting and noutraining random secretion of the gastrie secreting and noutraining random.

We do not deny the possibilities of calculating the hour tension of gastric secretion, the hour-yield of free hydro-filoric acid and the all aline component of the gastric secretion, the AAC and other indices in clinical practice. They

supply many physicians with valuable additional on the secretory and acid-producing gastric function, are undoubtedly of a wider scope than the commonly LT-me acid termined data c il sk total acidity of tá comings of thes tration method should be taken into consideration itst to reason that even the most complex calculations the produce clinically important information on the accreting and neutralizing functions of the stomach bet

part of the soid in the common gastric secretions has ready been neutralized. At the same time, examination of the whole volum the secreted gestric juice is of clinical interest also in termining the pH of the acid-secreting and neutral gastric zones since it characterizes the secretory acti of the stomach (the volume of gastric juice of del

acidity).

In joint study with Antsan we analysed the result the exemination of 141 patients with continuous gar acid secretion of heightened and medium intensity. amount of active hydrogen ions was calculated by m of Garshin's nomogram (Garshin, 1972) for determining rate of secretion of hydrogen sons in the gastric juice is necessary to note that the rate of elimination of hy of a state of elimination of the gen loos by th lished from a ume of gastric

gastric zone ha gram, however, yields data about the amount of hydro ons in the gastric juice, which is also essential for clinic It was noted that the average amount of acn) drogen sons an all examined groups was higher in mi han in females All indices of continuous gastric acid retion of heightened intensity exceeded the indices of c

inuous acid secretion of medium intensity. The amount of active hydrogen ions in patients with ame pli in the acid-secreting gestric zone but differe and taken come was commands one would be if patients in whom the pH of the antral portion was higher han the pH of the body (satisfactory secretion of mucus) The average amount of active hydrogen ions in the first roup always exceeded that in the second group This paralel persisted in the examination of both the basal secreion and the secretion after the atropine test. It shows nore marked neutralizing properties of mucus from the pyloric portion in the second group of patients with simlit pH indices in the acid-secreting zone of the stomach in this case the mucus may essentially reduce the amount A active hydrogen ions as if partly compensating for coninuous acid secretion. Finally the .....

" attive hydrogen ions in gastric juice is a valuable index. logether with the pH of the acid-secreting gastric zons t provides the possibility to study objectively the acid-producing and secretory functions of the stomach

These data taken together prove that the results of de-termining the amount of hydrochloric acid by the titraion method are inaccurate and inferior to the results of httagastric pH-metry. In modern conditions, methods in-

relying aspiration of gastric Juice do not comply with the equirements of the clinic, therefore at m necessary to use nethods for studying the pH in the zones of the acid-sereting and neutralizing gastric glands. Simple portable H-meters with two-channel pH-probes are fully suitable or every-day use in the climic.

## Chapter

5

Diagnosis of Anacidity and Continuous Acid Secretion in the Stemach

Accurate identification of gastric anacidity is imperiant not only from the standpoint of the application of profet freatment, but also because the condition is considered precancer. The fast circumstance is widely known among the population and affects many people mentally since anacidity is often demonstrated by aspiration methods.

With the development of the word of the light of several representations of the several representation of the several representation of the several representation of the several representation that determination of the amount of hydrochloric acid by titration is not sufficiently exact for the disgnosts of several representations of the several representation of th

Historius entrectory gastric anachlity is encountered rise. In Anny 20 open plan whom anachlity was revealed by the citation mixtured live (bottomle reflectory) anachlity was confirmed by pill metry in only \$1 to 15 h per cent, 10 to no out of lon prison.

True, or historian extractory, massifity can recently be

dismosed only after studying the pH in the zones of acidsecreting and neutralizing gastric glands and application of the histamine test.

## Continuous Gastrie Acid Secretion

Examination in the manner of any continuous and some tion to be the most com

of the stomach at that concerning the cause

continuous acid secretion is of particular practical value. This question was raised by climicists and physiologists previously but inaccuracies of the titration method prevented its study. Nevertheless, it was revealed that secreton of hydrochloric scid in a healthy organism has an intempted character. Continuous, or spontaneous, secretion of gastric juice was observed in humans and experimental animals with peptic ulcer and also in those with hyperparathyroidism, adenoma of the pancress or certain inflammatory diseases.

The study of this widely-spread type of acid-secreting function of the stomach, which brings much trouble to man, is being continued on a new methodological level

While studying case histories of patients with continuous acid secretion in the stomach we noted that extragastric inflammatory processes, such as diseases of the biliary tract, pancreatitis, appendicitis, inflammatory diseases of the upper respiratory tract, the intestine and subcutaneous lat, were most often attended with this type of acid secretion

We analysed the results of study of 141 patients with diseases of the biliary tract (hepatocholangitis, cholecysti-

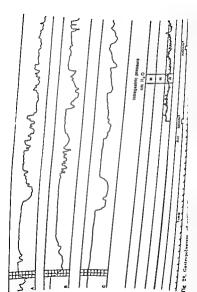
to hve years, from five to ten years, and over ten years

atminished

P\$ 27 (attrict) gram of pettent T. The same designations as in Fig. 17

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pH, 121 biopsies of the stomach and made 62 injections of terpentine (the work was performed jointly with Krampe

and Ranzan).

In the first part of the work subcutaneous abscesses were reproduced in seven dogs after normal gastric acid secretion in the initial state had been established, and the pH of various portions of the stomach was recorded by means of a gastropolygraph on the 3rd, 5th, 8th, 12th and 17th day after the injection of the turpentine solution On the and day continuous acid secretion was found in all dogs (Fig. 30) of heightened intensity in four and of medium latensity in three dogs. The subcutaneous abscesses were opened on the 6th to 12th day after injection of the turpentine solution. The acid-secreting function by this time normalized in two dogs, while in five animals it was still characterized by continuous acid secretion Parallel histological examination showed no changes in the gastric mu-

y process in this exnctional changes At ic chappes (vastritis) of the acid-secreting

similes is of essential significance for the clinic because here the matter is concerned with the pathogenetic treatment of such a common disease as chronic gastritis

To confirm the important role of continuous acid secretion in the development of morphological changes in the gastric mucosa we continued experimental studies. After the initial functional and morphological data were obtained subcutaneous abscesses were reproduced again in six dogs. lajection of turpentine solution was repeated after continuous acid secretion had ceased. Thus, in these experiments continuous acid secretion was maintained for a long time by repeated reproduction of abscesses. Aspiration

to Nachias' method. The rest of the material was fixated by Carnoy's fluid and embedded in paratian. PAS reaction was performed on paraffin sections for determining glucosamine glycines. To discover RNA the preparations



tre stained with methylene green pyronine according to Brachet. Survey preparations were stamed with harmato-

rylin-eosin.

The duration of the experiment was from five to seven months. In the second half the working capacity of the stric scid-secreting glands showed a tendency to decrease Continuous acid secretion of heightened intensity was establabed less often In those cases where it was observed its intensity diminished in several days or continuous secretion ceased altogether In individual cases the formation of an infliration or abscess was not attended with continbous seid secretion or the secretion was of a reduced intensity In three dogs the unitial morphological changes here revealed on the 18th, 21st and 22nd day after the first injection of turpentine solution. The surface of the stric mucosa was covered with mucus At places the surface epithelium was indurated and in separate cells a small amount of PAS-positive material was observed. Oedema of the mucous layer proper developed between the gastric pits PAS-positive granules appeared in individual chief cells of the gastric glands Similar changes in the other three salmals were found only 36, 43 and 47 days after turpentino had been administered for the first time

During dynamic study of the structure of the gastric mucosa in maintained continuous acid secretion we found that its deeper layers became involved in the morphological changes The amount of PAS-positive material in the surface epithelium reduced and induration became prohounced Separate tortuous gastric Dits of different depth were hible, in three dogs the connective tience of the murous layer proper proliferated in 56 to 57 days and grew between the gastric glands. The glands were arranged to groups PAS-positive granules were observed in many chief and in individual parietal cells in the other three does such changes were encountered on the 65th, 76th and 65th day of the experiment Successite dehydrogenase activity in the parietal cells was high at the beginning of the ex-Periment and decreased after 97 days. The oxyphilic pro-Perties of the parietal cells also diminished = staining with hacmata-coun There changes became deeper dur Inm the -



were stained with methylene green pyronine according to Bracket. Survey preparations were stained with haemato-

The duration of the experiment was from five to seven months. In the second half the working capacity of the fairle acid-secreting glands showed a tendency to decrease Continuous acid secretion of heightened intensity was established less often. In those cases where it was observed its latensity diminished in several days or continuous secretion ceased altogether. In individual cases the formation of an infiliration or abscess was not attended with contintous acid secretion or the secretion was of a reduced inleasity. In three dogs the mutual morphological changes were revealed on the 18th, 21st and 22nd day after the first injection of turpentine solution. The surface of the fastric mucosa was covered with mucus. At places the surface epithelium was indurated and in separate cells a small amount of PAS-positive material was observed Oedema of the mucous layer proper developed between the gestric pits. PAS-positive granules appeared in individual chief cells of the gastric glands Similar changes in the other three snimals were found only 36, 43 and 47 days after turpentine had been administered for the first time

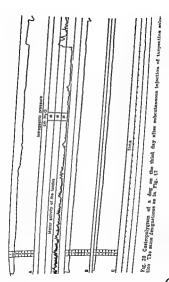
During dynamic study of the structure of the gestric mucoan in maintained continuous acid screttion we found that its deeper layers became involved in the morphological changes. The smount of PAS-positive material infailace spithshiam reduced and induration became proformed by maintaining and produced the property of the Database of the dark produced and produced by the pro-

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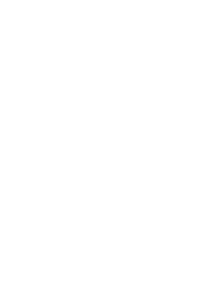
such changes were encountered on the Gith. Toth and ASth day of the experiment. Succinate dehydrogenase activity in the parietal cells was high at the beginning of the experiment and decreased site 97 days. The oxyphilic properties of the parietal cells also dimnished in statung with

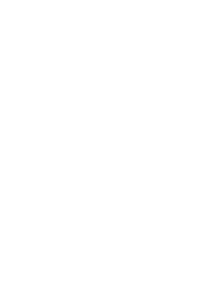














Consequently, the first structural changes in the gastric masses in our experiments were revealed 18 to 47 days following the control of the

whice the horizonte his gastritis to 85th day due to 40th experiment. Connective tissue of the microis layer tegan growing between the gastric glands but there are an europeyto inflittation, just and europeyto inflittation, just and enterprise and enterprise

over negar growing between the gastric glands but there so decocytic infiltration. Leucocytic infiltration, just a the initial state, proved to be insignificant. Thus, see changes in gastric mucoss characterize exhaustion the glandular structures without symptoms of inflamition.

Continuous and secretion (of heightened or medium inmaily) and a normal gastric mucosa are also observed in stancet conditions at the beginning of an inflammatory tinguatro disease. With a protracted inflammatory extrastine process the symptoms of chronic gastratia become parent. In these observations and in our experiment there a certain praising proceeding from which the pathomaiss of chronic gastratis (secondary or endogenous) can really explained. We see the picture of its development be as follows: the extragastric inflammatory process

we usupposed, vertex in different patients, continuous id accretion leads to exchanation of the acid-screting 18-3d. Examination of section of medium or reduced nuterally A, these of orac changes in the structure of the gentric mucosa begins id: changes in the activity of the respiratory enzymes id then the diagnosis of chronic gastritis is confirmed "spiration blooms."

## ockade of Continuous Acid Secretion

Questions relating to inhibition of heightened gastric id accretion have long been concern of clinicists. The ta Melded by intragastric pH-metry indicate that the

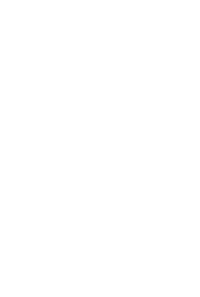
offect of antacids used for neutralization of hydrochlors acid in the atomach is abort-lived and their application is often unjustified. Medicinal agents blocking gettiers accreting activity are divided into several type-free codia control of their effect; agents inhibiting the roles and gangle blockly diminish the wagus effect (attract and gangle blockly diminish the wagus effect) and also preparations inhibiting secretory activity (enterogation).

The greatest number of investigations of blocked of gastric acid secretion was performed by using aronue Atropine as applied as a standard cholinolytic sgent, its effect designated by some authors drug vagotomy consists in effect designated by some authors drug vagotomy consists in effections, and other conducing the intensity of gastric secretion and execution (Bolousov, 1909, Demand and Fürst, 1909, and other) Under the sifect of gangloup-blocking agents the acid-secreting function was reduced (Denisenho. 1988; Limbest et al., 1908, and others). Neither atropine not ganglior-blocking agents, however, could arrest acid secretion in all cases.

Data on the increased brood histamine level in patients with heightened acid-secreting function of the stomator (Bidelman, 1967, Morhaskaya, 1967) made it possible to put in the foreground the role of histamine and bustamire itse substances in the origin and maintenance of heightened and continuous acid secretion in this organ. In view at this, great hopes were pleased on antihistamine preparations but testing of their effect showed that they did not inhibit the activity of the parietal cells and did not hinder the development of experimental geniric ulcers (Lin et al. 1962).

It has been established that histamine spent on hydrochlerie acid secretion is rapidly replaced by intensified decarboxylation of histidine (Albinus and Sewing, 1969). It was logical to expect that and secretion would comwhen these enzymes are blocked but experimental applidations of the company of the company of the comtained to the company of the company of the comtained to the company of the company of the comtained to the company of the company of the comtained to the company of the company of the comtained to the company of the company of the company of the comtained to the company of the company of the company of the comtained to the company of th

(Theyer and Marimidt and Martini, educe the level of



connection was established between blood circulation metabolic processes in the gastric mucosa and intragat

The diagnosis of gastric diseases may be promoted more precise information is gained on the relations er ing between intragastric temperature and the basic function of the stomach. Gastropolygraphic measurement of the and temperature in various gastric portions under exp mental and clinical conditions (Lejs, 1971) showed that temperature curves of the soid secreting and neutraliz gastric zones do not change noticeably during intragati pli shifts from alkeline to acid and from acid to alkali But the absence of an obvious increase or diminution intragastric temperature during the pH changes does indicate the absence of exo- and endothermal reactions the glandular tissue of the stomach during its activ (the process of production of hydrochloric acid is lim with energy expenditure). Gastric temperature simply flects the degree of balancing of these processes in

given area of the gastric mucosa It may be assumed that the value of intragastric to perature is linked with the state of the scid-produc apparatus. Evidence of this is the lower intragastric to perature during mechanical stimulation in patients w anacidity in comparison with the temperature of a secret stomach.

Diminution of temperature of different portions of stomach during its contractions was recorded on gast polygrams The temperature of the intermediate port changed most of all (sometimes by 0.5 to 0.9°C), less the temperature of the antral portion and still less th of the body of the stomach. The temperature of different gastric portions did not change or changed slightly in t period of 'hunger' contractions as compared to the period of 'rest', the gastropolygrams showed certain decrease temperature.

> the less the dire

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function of the stomach. This is confirmed by the following

We examined the gastropolygrams of 284 patients with gastric or duodenal ulcer diagnosed in the clima They were divided into four groups according to the term of the disease, up to one year, from one to five years, from bre to ten years and over ten years Anacidity was noted in mone of the cases. Moreover, in 94 per cent of cases with sestric ulcer and in 96 2 per cent of those with duodenal ulcer the acid-secreting function of the stomach in the morning was characterized by continuous acid secretion of varlous intensity Neutral intragastric medium was encoun tered in only individual cases, mostly in patients with a

chronic course of the disease

information on previous methods of aspiration of gastric puce was collected in 70 patients with peptic uicer Hyperacidity had been established in ten out of 26 patients and gestric ulcer, normal acidity in seven, subnormal acidity in another seven, and anacidity in two patients Among the 44 patients with duodenal ulcer, hyperacidity had been ascertained in 31, normal acidity in 10, subnormal acidity in two patients and anacidity in one patient These results fully agree with interary data but differ considerably from the results of intragastric pH-metry

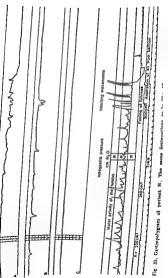
The indices of gestric acid secretion in patients with duodenal ulcor were basically higher than those in patients with gastric ulcer In most patients with duodenal ulcer, even with a long history of the disease, continuous acid Secretion of heightened intensity was revealed Analysis showed that the intensity of continuous acid secretion was mmewhat reduced with an increase in the duration of the disease, which may be associated with the exhaustion of

the acid-secreting gastric apparatus

The patients were divided into three groups according to the localization of the ulcer ulcer of the subcardial portion and body of the stomach, ulcer of the pyloric antrum, ulcer of the pylorus and duodenal ulcer It was established that the acid-secreting function is more marked in patients with ulcer localized in the pylorus, its antrum, and the duodenum than in cases of ulcer of the subcardual portion While these data with respect to the intensity of gastric









(3) the ulcer has cicatrized, (4) malignant degeneration of the ulcer takes place.

We shall briefly dwell on the interpretation of a record of gastric motor activity on the gastropolygram in functional diagnosis of peptic uleer. While natching intensification of the state of the sta

In weak and moderate mechanical stimulation of the stometo, the stometon of th

Though the 'symptom of pain waves' is not always positive in gastric ulcer it has certain diagnostic significance. We think that this symptom occurs in the following way during contraction the gastric wall touches the partially instacted balloon of the probe, at this moment the afferent nervous apparatus carrying pain impulses is switched on The patient feels pain and presses the pedid of subjective pressensitivity. When the contraction ceases the gestire pressensitivity. When the contraction ceases the gestire pressensitivity and the pain passes. Positive 'symptom of pain waves' is observed in patients with ulcers of the upper and middle third of the stomach, it is exactly these portions that touch the inflated balloon during contraction of the easter wall

No significant differences were found in examining the of a dosed was local-

This was con

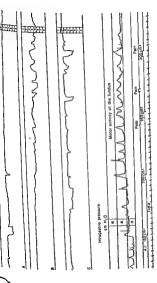


Fig. 33, Gastropolygram of patient M. The same designations as m Fig. 17

the threshold of subjective pressonantivity (SPT) whove in patients with gastric ulcer than in these will doudenal ulcer. The difference between the mean values it has note was more pronounced in patients with a short of the disease it is the state of the state of

## Cancer of the Stomach

Gastric cancer is one of the commonest type of malige mant tumours, the early diagnoss of which is of essentia importance for the successful treatment. It is necessary to collect gastric contents for symmatons and to determine the amount of hydrochloric acid in it. The acid-secreting function of the stomach is of interest to many clinically particularly oncologists, not only in cases of malignant umours but also in recessing anaetic gestrists, a precicerous state of the stomach, for which the patient shows be subject to regular all-round examination in an oncologic

Methods employing aspiration of gestric judes in gastric cancer patients most frequently show anacticity or sharply reduced acidity of the gastric judes (Swynnerion and Tritlove, 1952; Massirch, 1967, and others) Taking into consideration the shortcomings which are described above we

carry out gastropolygraphic studies

We examined 101 patients with gestric cancer using a three-channel pH-probe. These were mainly patients in soom stages III and IV cancer were verified in a inepital is only five patients stage III gestric cancer was diagnosed the sid exerction in the storach was preserved in most divid, even in those with stage IV carclaoms The troucond of recitive of the stomach increased in parellel with the direction was found in a stage of the stomach increased in parellel with the direction was found in a stage of the stomach are considered was found in a stage of the stomach and the initial state neutral stages.

lusts and continuous acid secretion in the rest A large Fram [22] over cent) was composed of patients with continuous secretion of reduced intensity. The intragast at the medium in these cases during the whole examination, of [3] 30.50 (Fig. 3) histanian test, was weakly acid as the secretion of the secretion of the properties of the patients with gratic and the properties of the propert

4 per test

dum/heled acid secretion (135 per cent) and continuous observed of medium intensity (115 per cent) were observed

In only 21 9 per cent of gastric cancer patients studied by at these was continuous acid secretion of heightened or medium intensity (normal secretion) as found only in three patients). In this continuous case of the secretion of the secretion in the patients in the secretion of the secretion o

In comparing the end-secreting function of the stomach and the localization of the malignant neoplasm it was observed that histamine-refractory anarchity was the most forquent finding (3.8 Bye creat) in patients in whom cancer and localized in the upper two thirds of the stomach, while which is described to reduced intensity in patients with loss acid secretion of reduced intensity in patients with the secretion of reduced intensity in patients with the secretion of the cancer in the lower third (17.5 per cent). We seem to be a secretion of the cancer in the lower third (17.5 per cent). We seem that the second group—with accumulation in the atomach of other organic saids, besides multiplied in the atomach of other organic saids, besides.

S. 34. Gastropolygram of putient P., The same designations as in Vig. 17

infregative pressure

-

hydrochloric sold, due to intensified process of givenlysis is the tomorous tiene and to the fermentation of gastric

torients due to impaired execuation similar picture of continuous and secretion of reduced istensity may be observed in ulcers of the upper and middle third of the stomach whose clinical course is less pronounced it is known that these ulcers often become matignant in the throng stage. Hence, in our opinion, an essential conthuson for pressing . . . be subieri : stands 10should

be uncrentiated from those which are due to chronic extragastric inflammatory processes

The data of intragastric pli metry which have been accampleted up to the present time indicate that surgical intervention is needed for patients with continuous acid Accretion of reduced intensity and an X-ray symptom of niche since malignant degeneration is possible in such this also applies to patients with initial neutral, weally sikaline or weakly send intraga-tric medium and

with a niche in the lower third of the stumach

To obtain data on the frequency of the types of gastric acid secretion in patients with various diseases of the gustro-intestinal tract, including those with gastric cancer. he studied the final diagnosis in all in patients who were examined by the OP-2 portable pff-meter in the Diagnostics Department at the Center of Gostroenterology and Dietetics Continuous gastric acid serretion was established in most of the examined patients (1080) of heightened intensity in 418 per cent, of medium intensity in 19 2 per cent and of reduced intensity in 12 3 per cent of cases Gastric cancer was disgnosed during further clinical examination in 16 Patients. Continuous scid secretion of reduced intensity and histamine-refractory anacidity were the most frequent findings. Continuous acid secretion of heightened intensity was revealed in two patients

While comparing the frequency of various types of acid secretion in patients with chronic gastritis and gastric ulcer, 1 e. the diseases which most often need to be differentiated from gastric cancer, it was found that the greatest distinctions exist between the groups of patients suing from where of the atomach (continuous and secret of heightened intensity is prevalent) and cancer of lorgan

As it follows from what has been said above, true odity with intragastric pH level of 5.0-8.0 is encounted.

in the smallest number of patients with malignant gas tumour Besides that, histamine-refractory anacidity quite an unexpected finding in rather young people so

of whom practically had no complaints of gastro-intesti disorders No pathological changes were found in care clinical examination of the stomach. Hence snother pr lem which is of importance for practical oncology srises regular all-round medical examination of all patients w anacidity expedient? This question requires careful che ing and rather long analysis, it is necessary to study dynamics of changes in patients with histamine-refracts anacidity. As regards the all-round medical examinati in cases of precancerous conditions only the following i pothetic conclusions can be made Anacidity of the stomach cannot be considered a prece cerous condition if it is revealed by titration of aspirat gastric juice Histamine-refractory anacidity revealed means of intragastric pil-metry is associated, in certa esses, with a malignant lesion of the stomach, but pr longed dynamic studies are needed in such cases Patien with continuous gastric acid secretion of reduced inte sity and complaints of dyspepsia are subject to obligator

the first hall of the gastiometrians, and a ratio, since, amount of air in the probe balloon (50 to 300 cm²). The amount of arrhythmic contractions is explained by the

all-round medical examination in an oncological instition, while those with an X-ray symptom of niche at continuous acid secretion of reduced intensity and al-



affection of the gastric nerve apparatus with a matumour. At the same time, in other patients the mechanogram is characterized by rhythmic motor as In some patients there were no gastric contractions the whole period of study.

A high threshold of subjective pressonalityly is observed in patients suffering from gastric ansite often to threshold even when the maximum ame air is introduced into the balloon. Malignam as sometimes attended with middly pronounced gry of the patients noted a feeling of fullness in trum) or there is no threshold A comparatively high middly pronounced SPT is ovidence in favour of the gested inhibition of affects herevis impulses in the second of the second o

Taking into account the high incidence of gastric and the small effectiveness of prophylactic examiles and the search for new means of early diagnoss of the facquires particular importance. Stage by stage fort of groups of people with a high risk of gastric cancer to be one of such means (Stengtowitz et al. 1974) suggested that at the first stage case histories which tain certain points related to the risk of gastric are initially selected. At the second stage selection by means of laboratory tests (heaving point intention of the continued by X-ray examination of the city of the point of people with a high risk of gastric cancer with sequent all-round medical examination of some of the tipnts and their further stand (gastroscop), gastrooit

## A Stomach Subjected to Surgery

Bease

application in Himital 1.



73 to 10th per cent of cases (Pechatnihava and Kuincine I/2), and others) Largain authors Origer and West, 102 Scienda and Simolahama, 12-3 Simolahama, 12-4 Si

At the same time integratic pilinarity there a late least cutable of cases with anacting after frection of the stomach. We studied the functional state of the gestin stump by means of a three-channel pilipnote and gastro-polygraph in 112 patients after various types of resection Next of them (122 patients) had underpone resection of two thirds of the atomach for peptic ulcer. In the other 21 patients subtotal resection or resection of two thirds of the stomach for peptic ulcer. In the other 22 patients with the period of the stomach had been carried out for matignant mophisms. Assuming that and a screen on the gastrie atom purple

lealing to the development of poptic alcer-

stomatch had been carried out for matignant neoplasma. Assuming that aris accretion in the gastric sitump might be avocated with the posterection syndrome. If addition to the OTP attents admitted to the clinic because they remained of dyspeptic disorders after operation, we cailly invited 25 patients to there is gondition tropolygraphy three months but patients with no complete the properties of the properties of the complete of the properties of the complete of the complete of the patients of the complete of the complet

The male result of complaints of the male result of

acid secretion section Continuous 26.8 per cent 20 per cent of

tinction betwintensity of tients adminumber) cormedium ir

for examination



72 to 100 per cent of cases (Pechatnikova and Kunnetsov, 1969, and others) Certain authors (Steger and Weis, 1955, Stienko and Samokhwalov, 1968, Samokhwalov et al., 1972, beliove that the appearance of free hydrochloric acid in the gastrio stump is a grave disturbance in stump function leading to the development of peptic illers

At the same time intragastric plf-metry shows a far lesser number of cases with anacidity after resection of the stomach. We studied the functional state of the gastric stump by means of a three-channel pH-probe and gastropolygraph in 142 patients after various types of resection Most of them (122 patients) had undergone resection of two thirds of the stomach for peptic ulcer. In the other 20 patients subtotal resection or resection of two thirds of the stomach had been carried out for malignant neoplasms. Assuming that acid secretion in the gastric stump might be associated with the postresection syndrome. in addition to the 97 patients admitted to the clinic because they complained of dyspeptic disorders after operation, we specially invited 25 patients to check their condition by gastropolygraphy three months and one year after suigery, but putients with no complaints of dyspepsia were chosen-

The main result of this examination was that preserved acid secretion of the gastric stump was found in most patients. In only 15 out of 97 patients (15 5 per cent) histomine-refractory anacidity was established. In the first 22 months after stooms.

anacidity of the gastr group of patients admi specially invited for

section m detected only in remote periods after to section

Continuous acid secretion in the stump was observed in 26.8 per cent of patients admitted to the hospital and in 20 per cent of those called for examination. The main distinction between these groups of patients was the differ

intensity of continuous acid secretion. In a grottients admitted to the hospital (15.5 per ...

number) continuous acid secretion medium intensity, while in the This was evidenced by diminution of the gastric stump pH during mechanical stimulation or after the histamine test.

In the abdomen and was admitted to our hospital Examination showed no cancer recurrence Diminished send secretion was established by gastropolygraphy

Neutral or weakly alkalme medium in the gastric stump in the initial state was established in 91 out of 122 patients with two thirds of the stomach resected for peptiants with two thirds of the stomach resected for peptial that we have a state of the s

The stump of a resected atomach differs greatly from a stomach which had not been operated on in most cases the pyloric antrum and intermediate portion of the stomach are resected, these are the portions responsible for the local self-regulating mechanisms of its activity. Heades that, and what is no less important, with resction of the pyloric online a powerful area of mucus production is removed a succost barrier between the acid medium in the stomach with the other control of the stomach and the other control of the other con

associated glands and

In wat out well in

lating and

Continuous and secretion of heightened or medium intensity in the gastric stump should be considered a graw disturbance of the function of the gastro-intestinal tract As a result of it, the strongly sed gastric contents enter the intestine without being neutralized by the micus of the antral portion, which promotes the development of the antral portion, which pointed the development of the strong point of the property of the protion that the Jollinger-Ellinon syndrome. the artiferential derivation of related intentity for in the patients fastiful for examination for the character of residual plenumena of postic sleet.

the hearder of residual placemens of peptic sites in the model of the period of the heard of the

There were eight patients with peptic ulter of the suffistump or small intestine disgueed by X-ray. Continue actid secretion of heightened intensity was established three of them, of medium tensity in one, diminishncial secretion in two, preserved secretory capacity that loved of normal and secretion in one, and histamine-thertory anactidity in one patient in the last case the pair localised mainly in the right hypochondrum and during folds of the gestric stump as found and tenderness and folds of the gestric stump as found and tenderness and clicited, on the grounds of which peptic ulter of the patient stump was suspected

atump was suspected
Gastropelygraphic data confirm once again that ther
the succession without acid. They do not confirm, howest,
the assumption that peptic nicers of the gastine symp,
anastomesis or of the small intestine develop often or rea

Analysis of the data of intragestric pH-metry of patients who underwent resection of the stomach suggests that the excitation threshold of the acid-secreting apparalus of the stump diminishes in comparison with its level in the stomach with peptic ulcer before the operation This is evidenced by the cessation of continuous acid secretion after tesection, despite the preserved acid-secreting capacity of the gastric stump, and the diminution of its maximum acid-secreting capacity It may be assumed that the diminished excitability of the acid producing glands is con nected with the removal of the pyloric antrum and intermediate gastric portion due to which secretion of hydrochloric acid with the participation of gastrin ceases

Finally, we consider it expedient to emphasize once again that the acid-secreting activity of the stump of a stomach resected for peptic ulcer is preserved in most pa tients. It is to the point to mention here that acid secre tion in the stump is inhibited to a greater degree in re section of two thirds of the stomach for polyposis or a malignant neoplasm than after resection for pepti-

ulcer

It is necessary to note the great practical important. of intragastric pit-metry in examination of the medium () the gastric stump Clinicists know that in these cases the amount of gastric juice collected by aspiration is not suf acient for titration, and that cometimes gastere juice can not be aspirated at all. This can be explained by a wide gastro-intestinal anastomosis, rapid exacuation of the gas tric contents from the stump, comparatively small produc tion of gastric juice after resection and by other factors Methods used occasionally in such cases in which during aspiration of the gastric contents the gastro intestinal anas tomoris is blocked with a balloon to present the evacuation of gastric juice from the stump, are not physiological. The method of measuring the pH directly in the gastric stump and in the region of the gastro-intestinal anastomore is devoid of these shortcomings

Comparison of the average threshold of subjective preforensitivity shows its higher values in patients invited for examination than in those admitted to the hospital This phenomenon apparently evidences higher excitabili-



study of the functional state of the stomach in the surgical and gastroenterological clinic but also for making the procedure easier and reducing the duration of the examination, e.g. by combined exomination of the gastric and doudenal function, studies with pH-imferoprotes, etc. The new data obtained make it possible to comprohend in a new light the acid-secreting function of the stomach in the most common gastro-intestinal diseases and after surgical interventions on the atomach. They also help in prescribing the proper treatment. We believe that these premiting methods of study will be developed further in the nearest future, and will considerably improve the quality of evanuation and predetermined treatment of a large number of

patients suffering from gastro-intestinal diseases



study of the functional state of the sand gastroenterological clinic but all and gastroenterological clinic but all cedure easier and reducing the during the during the during the during the distribution, e.g. by combined examinative dunderal function, studies with pH light the ared-secreting function we most common gastro-meterianal discrementation of the stomach. They completely the second property of the stomach they methods of study will be developed future, and wall considerably imper future, and wall considerably imper

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## Subject Index

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POR CENTRE

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achiorbydria 51
                                                  electrode 9
   in peptic ulcer III
                                                       antimony 9 13 18 calomel 13, 18 22 Fig 7
after stomach resection $11, $12
acid accretion 35
diminished 57, Fig 19
                                                       measuring $
                                                       reference
                                                  enterogastron $2
   normal III
   continuous $2, 822
     of hightened intensity 62, 63f of reduced intensity 64f
                                                  "false anacidity" 83
atidimechanograph 22f, 32f
Midimechanography 68
                                                  gastric anacidity $7
atkaline test 62
anacidity 82f
                                                  gastric motor activity 32!
                                                  gastric peptic picer 961
    diagnosis 83
histamine-refractory 59, 68, 82
                                                       sold-secreting function 97
                                                       continuous soid secretion 98 compensated 98
    histamine-relistant 59
                                                          decompensated | of beightened intensity 98
espiration of gariric juice 677
by Boas-Fwald method, one-stage,
                                                          Intermediate states 95
67, 65
51copine test 53, 58
Regalive after vagotom) 198
                                                          of medium intensity P8
                                                       indices of acid secretion
                                                   dagnetic significance 98 hr pil-m-try 97 gastric slump 118, 112 acid secretion 111 112, 114, 115,
birchade of continuous seld secretion
         BLE
                                                       types of 112 histamine-refractory anacidity 112
talomet electrode 13, 18-22
    application 18
                                                       intensity of acid secretion 112, 114
    Schign Fill
Filternal El. Ri
Siling of 19
                                                       plt 114, 115
plt-metry 117
                                                        recurrent alogs 114
    internal 18
                                                       Zollinger-Ellison syndrome 115
    manufacturing 20, Fig. ?
                                                   gentratus, anacid 104
    Doetting 18
storage 28
                                                   gastro-oreophicrel redux 25 #1
tancre, gariric 104
                                                   gastropolygraph 221, 32
    acid-secreting function 185
acid secretion 185
types III 185, 187, 188
anniality 103
                                                        dengen
                                                       1125-44 23 F16 8
       true 198
    arrhythmic gostric contractions 108,
                                                    histamine test 49, 50, 52
contrainducations 49 58
     threshold of presson-saltivaty (18
                                                        after vagotomy $10
                                                    hypager "
```

..

-

441

OP-2 5 test 45, 491, 78 alcohol sulutum II pli-metry, intragastric 427 cabbare water 14 off microprobe 13f application 13. 14 folia) 48 design 13, 14 four-channel 14 13 Fig 4, Fig 14 meat broth 45 prolonged examination with 39f peptone meat 13 three-channel 26, big 10, big 11. Frant 15 13 337

two-channel 15 combined 15

pil-olives ti. 12 body it end to Fig 6 Intermediate 15

pH-probes 8f multichannel, of closed type 10.

Pig 1 position in the stomach 26f, Pig 23 techniques of introduction 24-26 two-channel to

ateel mandrine 30, Fig 2 application 30, 31

Insulin 49

design 30 introduction 30, 31 stimulants of acid secretion 48f

parenteral 40, 500 gastrin, terra- and pentapeptide 49 bistagol (betazole) 49 histamine 49

eatchey decoction (Silene la green-tea decoction 15

stimulation of the stomach 21, dosed mechanical, after Lina 32f, 103 mechanical 49

with atimulants 45, 49 surface anaesthesia of throat muco effect on acid-occreting function 26 symptom of pain waves' 102

diagnostic significance in garici positive 103 teleradiometry 63 threshold of subjective pressonsists vity (SPT) 327, 102, 104, 111 in dudenal above 103, 104 in gastro above 103

titration method 50, 68 verstomy tes

acid-secreting function 118, 111 Rantrupolygraphic follow-up 114 types of 118, 119

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